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THE CHRYSOMELIDAE OF FLORIDA

By W. S. BLATCHLEY
Dunedin, Florida

(Continued from Vol. VII, No. 4)

*103. (15593). **M. laevicolle** Cr.—Enterprise and Lake Ashley (Sz.); L. Poinsett (Sz. Ms.). Dunedin, July 24, at porch light.

*104. (15594). **M. ludidum** (Oliv.).—Eustis, Apr. 7, beaten from oak; Dunedin, Mch. 29-July 1, on the latter date at porch light. Known heretofore only from South Carolina and Georgia.

105. (15595). **M. marginale** Cr.—"Common" (Sz.). Gainesville, beating oak foliage, Apr. 3 (Doz.). These records may refer to *luridum*.

*106. (15596). **M. maculipenne** Sz., 1878, 366.—Types from Enterprise on live oak, *Quercus virginiana* Mill. Occurs south, at least to Miami, La-Belle and Marco. Frequent about Dunedin on oak; at Palmdale swept in numbers from a species of St. Johnswort, *Hypericum*. I have recently taken this species in Posey Co., Ind.

*107. (15597). **M. pellucidum** Cr.—Frequent as far south as L. Wales. Common about Dunedin, Nov.-Apr., on oak, wax-myrtle, etc.

*108. (——). **M. testacea** Blatch., 1920. 70.—Types from Key West, Mch. 1-3, by beating shrubs.

*109. (15598). **M. pallidum** (Say).—Throughout the State. Dunedin, Nov.-Apr., by sweeping tall grasses about the margins of ponds, also on foliage of red bay, *Persea borbonia* L.

*110. (15599). **M. floridanum** Cr., 1873, 43.—Types from "Florida." Ranges as far south as Biscayne Bay. Sanford and Dunedin, Mch.-Apr.; at Dunedin taken only on Hog Island, in the axils and on the heads of the yellow thistle.

111. (15600). **M. puncticolle** Lec.—Crescent City, Apr. (Wic.). Orlando and Cleveland (Kn.). Known from Georgia and Texas.

*112 (——). **M. strigicolle** Blatch., 1924.—Types from Dunedin Mch. 21-Apr. 11; taken at porch light.

*113. (15601). **M. quercatum** (Fabr.)—"Common" (Sz.). Ranges south to Lakeland and Dunedin. Taken at Dunedin only in April by sweeping huckleberry and other low herbage.

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XXI. **Myochrous** Erichson.

Medium sized oblong, convex species (5-7 mm.), piceous-brown, thinly clothed with hair-like scales, the thorax toothed on sides and with postocular lobes in front. Larvae unknown.

*114. (15608). **M. denticollis** (Say).—Common (Sz.). North half of the State, south to Lakeland and Dunedin. Frequent about Dunedin, Jan.-Apr., in winter beneath cover along the margins of ponds; in spring on huckleberry and other blossoms; once at carrion trap. Gainesville, July-Aug. on grass, ferns and corn (Wat.).

XXII. **Typophorus** Erichson.

Rather large (6-7.5 mm.), oval, convex, greenish-blue, glabrous shining species, with punctures of elytra in regular rows and hind tibiae notched near apex. The adults occur on bindweeds, morning glory and other Convolvulaceæ.

*115. (15625). **T. viridicyaneus** Cr.—Gainesville; one eating sweet potato foliage, Aug. 18 (Doz.); one at hand, taken by Fattig, May 14. No other State record.

XXIII. **Paria** Leconte.

Small (3-4 mm.) dull yellow, reddish-brown or blackish species, closely related to *Typophorus*. The larvae feed at times on the roots of strawberry, while the adults occur on wild grape and numerous other plants. Horn (1892, 208) lumped all our forms under one name and Leng so catalogues them. There is no doubt but that three or four distinct species occur in the eastern and southern States.

116 (15626). **P. canella** (Fabr.).—Ft. Myers, Apr. 23 (Davis Coll.); Lawtey, on wild grape (Wat.). Larger than the other forms, dull red with suture and two large spots on each elytron piceous, tibiæ and tarsi fuscous. The *T. canellus quadriguttatus* listed by Wickham from Ft. Myers was probably this form.

*116a (15626a). **P. canella aterrima** (Oliv.)—Throughout the State. At hand from six stations, Dec.-Apr. Taken by beating in dense hammocks; also beneath cover, and once several specimens by sifting a pile of rotten unhulled rice. Gainesville, always in low ground, July-Oct. (Wat.).

*116b (15626h). **P. canella thoracica** (Melsh.)—Dunedin, Apr. 19; sweeping low herbage.

*116c (15626e). **P. canella quadrinotata** (Say.).—At hand from Sanford, Palmdale, Ft. Myers, Tarpon Springs and Dunedin, Mch.-Apr., by sweeping St. Johnswort, tall grasses, etc., near ponds.

*116d (15626g). **P. canella sexnotata** (Say).—Throughout the State. About Dunedin it is taken frequently—Dec.-Apr., but only by sweeping and beating ferns and other foliage in a dense wet hammock. Mt. Dora on oak, June (Wat.). It is this variety and *aterrima* whose larvæ do much damage to strawberries in the North.

The last four forms mentioned are, as treated by Horn, only color varieties of one species, but whether that species is typical *canella* or not, is questionable. It should probably be known as *aterrima* (Oliv.). The *P. sellatus* Horn and *P. opacicollis* Lec. are both, in my opinion, valid species.

*117 (——). **P. opacicollis** Lec.—Gainesville; taken by Watson in July by beating along the edge of a cypress swamp. Since I first recorded this form from Florida (1923, 31) I have taken several additional examples in Indiana, and a careful study of them shows that they are undoubtedly distinct from any of the forms listed as varieties of *canella*.

XXIV. **Labidomera** Chevrolet.

Large oval, strongly convex species (8-12 mm.) having the elytra yellow with large black markings; front femora of male strongly toothed. Adults on milkweed. This and the genera up to XXIX possess the characters mentioned under *Colaspis* except that the front coxae are transverse and the third tarsal joint usually entire. (Subfamily *Chrysomelinae.)*

*118 (15639). **L. clivicollis** (Kirby.)—Dunedin, Feb.-Mch.; taken by beating dead leaves and bunches of the slender climbing milkweed, *Metastelma scoparium* Nutt. (Bl., 1919). The only definite record for the State.

XXV. **Leptinotarsa** Stal.

Oval, strongly convex species of medium size (6-11 mm.) having the elytra dull yellow, with double rows of confluent punctures, the suture and five narrow stripes on each black; front femora unarmed.

119 (15648). **L. decemlineata** (Say).—Northern tier of counties from Pensacola to Jacksonville; on the Gulf coast as far south as Panama City *(Wat.)*. Known as the "Colorado potato beetle." Food plants, potato, horse nettle and other Solanacea. No definite Florida record in any of the literature at hand.

XXVI. **Calligrapha** Erichson.

Oval, convex species of medium size (6-9 mm.), having the elytra yellow with brown stripes or small bronzed spots, and sides of thorax not thickened, third tarsal joint entire. Both larvae and adults feed on foliage of various species of shrubs and herbs.

*120 (15665). **C. similis** Rog.—Northern two-thirds of the State. At hand from Gainesville, Lakeland and Dunedin. Frequent about Dunedin, Dec.-Mch., on flowers of various Compositæ.

121 (15667). **C. cephalanthi** Sz., 1878, 366.—Types from Ft. Capron, L. Harney and Tampa. Enterprise (C. & L.). Ft. Myers, Apr. 26 (Davis Coll.) (Bl., 1923). Labelle (Kn.). Occurs only on the button-bush, *Cephalanthus occidentalis* L.

*122 (15671). C. scalaris Lec.—Enterprise and Tampa, as *multiguttis* Stal., a synonym (Sz.); Crescent City (Wic.). At hand from Ormond, Utopia and Dunedin, Dec.-Apr. Scarce about Dunedin on foliage of wax-myrtle. Knab once identified this for me as *C. rhoda floridana* Knab (Ms.), and I have sent them out under that name, but I can see no difference between them and typical *scalaris* from Indiana.

XXVII. **Chrysomela** Linnæus.

Medium sized oval convex species (7-9 mm.) having the elytra wholly blackish- or greenish-bronzed, and the side margins of thorax thickened. The adults occur on cacti and thistle.

*123 (15692). C. subopaca Rog.—Crescent City and Bartow (Sz. Ms). At hand from Jacksonville and Gainesville. La Belle, Apr. (Kn.). Occurs on rape (Wat.).

XXVIII. **Phædon** Latreille.

Small oval greenish species (3-4 mm.) having the third tarsal joint emarginate, sides of thorax not thickened. Habits not known.

124 (15699). P. viridis (Melsh.)—"Enterprise and Tampa, rare" (Sz.); Crescent City (Sz. Ms.)

XXIX. **Lina** Redtenbacher.

Oblong-oval, sub-depressed species of medium size (7-9 mm.) having the elytra dull yellow interrupted with black lines; sides of thorax thickened, third tarsal deeply bilobed. Food plant, willow, cotton-wood, etc.

*125 (15710). L. scripta (Fabr.)—Recorded from numerous stations as far south as Miami and Everglade. At hand from eight localities, Feb.-Apr.; taken mainly by beating a dwarf willow. On Carolina poplar, Gainesville, Aug. 20 (Doz.). No Carolina poplars in Gainesville (Wat.).

XXX. **Monocesta** Clark.

Very large oval, blue and yellow species (10-16 mm.) having the claws of tarsi bifid, outer edge of tibiae deeply sulcate, thorax with a broad median transverse impression. The species of this and all the genera up to XXXVIII have the head inserted in thorax to eyes, antennae close together at base, last dorsal not exposed, front coxae conical, prominent, hind femora slender. (Subfamily *Galerucinae.)*

*126 (15720). M. coryli (Say).—Palmetto, July 3, on elm (Bl. 1918). The only State record. The largest of our Chrysomelidae. Occurs on hazel in the North.

XXXI. **Halticidea** Hom.

Very small, oblong-oval species (2.5 mm.) having the elytra bluish-green and tibiae feebly carinate on outer side.

127 (15722). **H. Modesta** Horn., 1893, 62.—Types from Biscayne Bay. Cocoanut Grove (Sz. Ms.). No other records.

XXXII. Trirhabda Leconte.

Elongate-oblong, medium sized pubescent species (7-10 mm.), dull yellow with dark stripes on elytra and having the third joint of antennae shorter than fourth, front coxal cavities open behind and tarsal claws deeply bifid. Both adults and larvae feed on the foliage of prickly ash, *Xanthoxylum americanum* Mill., and other Rutaceæ.

*128 (15724). **T. tomentosa** (Linn.)—Northern portion of the State south to Sanford and Dunedin. Abundant at Dunedin, Mch.-Apr., defoliating the tooth-ache tree, *Xanthoxylum clava-herculis* L. Gainesville, Apr.-May, on citrus, pecan and prickly ash (Wat.).

129 (15725). **T. brevicornis** Lec.—"Enterprise, common" (Sz.); St. Augustine (Ham.); Gainesville, Apr., defoliating prickly ash (Doz.).

*130 (15726). **T. virgata** Lec.—"On the Atlantic coast from Massachusetts to Florida" (Horn, 1893). Dunedin, July 1, at porch light.

XXXIII. Galerucella Crotch.

Small oblong-oval, dull brown or reddish, pubescent species (3.5-6 mm.), the elytra usually with three or more narrow dark stripes; third joint of antennae longer than fourth. Both adults and larvae occur on plants of various kinds, especially those growing in moist places.

*131 (15744). **G. americana** (Fabr.).—"Tampa, very rare" (Sz.). Dunedin, Jan. 1; one specimen beneath bark of dead oak. No other State records. Occurs on golden-rod.

*132 (15745). **G. sexvittata** (Lec.).—Lake Wales and Dunedin, Dec. 31-Apr. 13; taken by sweeping low herbage along the borders of hammocks and found hibernating beneath pine bark (Bl. 1923). Lakeland, May 8 (Davis Coll.).

*133 (15748). **G. integra** (Lec.).—"Common" (Sz.). Ranges south to Tampa (Sz. Ms.) and Lake Okeechobee. One specimen at hand from the latter point, May 3.

*134 (15749). **G. notulata** (Fabr.)—Northern three-fourths of the State, south to La Belle. At hand from five stations, Dec.-Apr.; the most common species about Dunedin. Occurs on ragweed, *Ambrosia* and other herbage.

*135 (15750). **G. notata** (Fabr.).—"Enterprise and Tampa, rare" (Sz.). Sanford, rare, Apr. 3, swept from boneset, *Eupatorium perfoliatum* L.

*136 (15751). **G. nymphææ** (Linn.).—Moore Haven, Mch. 2; on flowers of yellow water lily (Bl. 1919). The only record for the State.

*137 (——). **G. bivittata** Blatch., 1920, 70.—Types from Dunedin, Mch. 21; swept from huckleberry blossoms. The only record.

XXXIV. **Monoxia** Leconte.

Resembles *Galerucella* very closely. Tarsal claws narrowly bifid in males, simple in females; antennae not reaching middle of body. The species occur near the coast, usually on submaritime plants.

*138 (15755). **M. puncticollis** (Say).—Occurs on both the Atlantic and Gulf coasts. At hand from Ormond, Key West, Everglade and Dunedin, Nov.-Apr.; recorded from several other stations. Swept from a swamp golden-rod growing in brackish water, and from the foliage of the mangrove, *Rhizophora mangle* L. Formerly listed as *Galeruca maritima* Lec. Varies much in color, many specimens being devoid of the usual elytral dark stripes.

*139 (15758). **M. batisia** Blatch., 1917, 273.—Types from Hog Island, opposite Dunedin, Jan.-Apr., where it occurs in numbers on the saltwort, *Batis maritima* L., a fleshy-leaved seaside plant. No other record.

XXXV. **Diabrotica** Chevrolat.

Small or medium oblong-oval, glabrous species (4-7 mm.), dull yellow in hue, the elytra with black stripes or spots, thorax impressed at middle, front and middle tibiae with spurs. Both larvæ and adults are active plant feeders, the former attacking the roots, and often doing much damage to cultivated crops.

*140 (15769). **D. 12-punctata** (Fabr.).—Throughout the northern three-fourths of the State, but less common than in the North. At hand from Sanford, Dunedin and Ft. Myers, Dec.-Mch.; taken by sweeping golden-rod and other weeds in gardens. Gainesville, abundant the entire year (Wat.).

*141 (15781). **D. vincta** Lec., 1878, 416.—Types from Capron, "Tampa and Orange Co., very rare" (Sz.). Enterprise (C. & L.); Ft. Myers (Wic.). Lake Okeechobee, rare on *Ambrosia* (Bl. 1914). Dunedin, Mch.-Apr.; on ferns in dense hammocks, and at porch light.

*142 (15782). **D. vittata** (Fabr.)—Throughout the State, common in the northern and southern thirds, much less so in central one. Big Pine Key (Davis Coll.). Frequent in gardens at Canal Point and Moore Haven, Mch.-Apr. This is the "striped cucumber beetle," very injurious to cucurbs of all kinds; "also on satsumas" (Wat.).

XXXVI. **Phyllobrotica** Redtenbacher.

Medium sized, elongate-oval (5-6 mm.) black and yellow species, thorax transverse, impressed, tibiae without spurs. Usually found on marsh plants.

*143 (15791). **P. costipennis** Horn, 1893, 99.—Types from Georgia and Florida. Crescent City (Sz. Ms.). Clearwater and Sanford (Wic.). Ft. Myers, Mch. 30 (Davis Coll.). Gainesville, in flat woods, July 4 (Wat.). Orlando and La Belle, Apr. (Kn.).

*144 (15792). **P. discoidea** (Fabr.).—Ocala, Apr. 14 (Bl. 1923). The only State record.

XXXVII. Luperodes Motschulsky.

Small oblong-oval pale brownish-yellow species (3-4.5 mm.) having the head transversely grooved between the eyes, thorax not impressed, tibiae with spurs, first joint of hind tarsi longer than the next two.

145 (15810). **L. varicornis** Lec.—St. Augustine (Ham.). The only State record. Known from Georgia.

XXXVIII. Cerotoma Chevrolat.

Small oblong-oval species (3.5-5 mm.), dull yellow, rarely reddish, with black spots; front coxal cavities closed behind; tarsal claws appendiculate. Injurious to beans, bush clover and other legumes.

146 (15854). **C. trifurcata** (Forst.).—"Cedar Keys, one specimen" (Sz.). Gainesville, taken in abundance on cow-peas (Doz.).

XXXIX. Blepharida Rogers.

Robust oval convex species of medium size (5-7 mm.), dull yellow with reddish-brown markings on elytra; front coxal cavities closed behind. Occurs on sumac, *Rhus*. In this and following genera up to LVIII the hind femora are greatly enlarged and thickened for leaping. They form the subfamily *Halticinae*.

*147 (15858). **B. rhois** (Forst.).—Northern three-fourths of State, south to Palmdale. At hand from L. Wales, Palmdale and Dunedin, Feb.-Mch.; swept from sumac.

XL. Hypolampsis Clark.

Small oblong-oval, piceous species (2-4 mm.), thickly clothed with grayish pubescence and erect brown hairs; front coxal cavities closed behind; elytral punctures in rows; last joint of hind tarsi globosely inflated.

*148 (15861). **H. pilosa** (Ill.).—"Tampa, very rare" (Sz.). Enterprise (C. & L.). St. Petersburg (Wic.). Scarce at Dunedin, Mch.-Apr., on weeds along the borders of ponds.

XLI. Hamletia Crotch.

Small elongate-oval black species with green elytra (3.5 mm.); elytral punctures confused; front coxal cavities open behind; first joint of hind tarsi short and broad, last one globosely inflated.

149 (15864). **H. dimidiaticornis** Cr.—"Lake Ashley, one specimen in June" (Sz.). Jacksonville (Sz. Ms.). No other State records.

(To be continued)

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LIFE HISTORY OF THE NEW CITRUS APHIS

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The life history studies of this species have been somewhat complicated because of its alternate host plants.

We have carried on generation studies from May 2d to June 20th in the field, at Lakeland, Florida. Since that time these studies have been transferred to Gainesville, where they are now being conducted. A summary of these studies thus far gives the following results.

Viviperous females were used in starting these studies as no eggs or stem mothers were found. The reproductive period of the female varied, during the time of these studies, from 2 to 11 days, with an average of five young per day. The longevity of the females used ranged from 3 to 21 days. In most cases death was due to natural causes. We must, however, take into consideration the conditions of temperature and humidity which would have some influence on the mortality, as the experiments were conducted under a tent where the temperature ranged from 85 to 98 degrees.

The maximum number of young produced by a single female was 61, and the minimum was 8. The birth rate was highest in the early life of the female and the largest number of young were brought forth during the morning hours. The percentage of winged individuals produced during this series of experiments ranged from 45 to 69.

DESCRIPTION

Alate Viviperous Female. Eyes carmen; body rather long and plump; head normal, dark; antennae shorter than body, reaching

approximately the 4th or 5th abdominal segment; sensoria present; body dark green, with dark irregular area covering most of the torsal part of the thorax. Cornicles dark, slender, tapering slightly at the apex and reaching almost to the end of the cauda. Cauda twice as long as tarsi; fusiform, and slightly constricted at the base of the body; supporting four slender, curved, projecting lateral hairs on each side of the cauda. Wings normal.

Apterous Viviperous Female. Eyes carmen; body pea green with dark green shading on thorax; head normal; antennae shorter than body, reaching approximately the 4th or 5th abdominal segments; sensoria present; cornicles dark, slender, tapering slightly at the apex and reaching almost to the end of the cauda. Cauda twice as long as tarsi; fusiform and slightly constricted at base of body; supporting four slender, curved, projecting lateral hairs on each side of the cauda. No wings.

STAGES

This insect was found to have five instars with four molting periods. The length of the first instar was about 20 hours, the second was about 24 hours, the third about 26 hours, the fourth about 30 hours, and the fifth about 35 hours. The range of life of the nymph was from 5 to 11 days. The period of birth was on an average two and a half minutes, and the period of molting ten minutes.

Molting. The time required for molting was observed to be from 10 to 20 minutes. The skin divides at the head which is moved forward and forced out of the cast. The feet and antennae are released first, followed by the body, the cauda being the last portion to be extracted.

First and Second Instars. The first and second instars of this insect are almost identical in form, except that in the second instar the body becomes somewhat enlarged and elliptical in shape, tapering to a rounded point at the cauda; while in the first stage nymph the lateral portions of the body are almost parallel with the head, and the cauda tapers abruptly. Eyes reddish.

The second stage nymph soon after molting takes on a pea green color. The last two segments of the feet are a dusky color, and the last two joints of the antennae are also dark. The distal half of the cornicles are darkened, beginning at the tip, with a dusky area on body joining the cornicles. Eyes dark red. Cauda pea green with blackish tip. The nymph moves about

quite freely until a suitable place is found, but is very quiet while feeding.

Third Instar. Eyes red. Body pea green. Body gradually becomes enlarged from the head almost to the cornicles at which point the abdomen tapers off to the cauda. Cornicles almost transparent with dark tips; dark greenish area between the cornicles. In the individuals destined to become winged the wing pads begin to develop.

Fourth Instar. Similar to the third. Body slightly more enlarged. Last antennal segments dark. Cornicles about one third darkened. Wing pads more prominent.

Fifth Instar. Color of head and thorax, amber. Abdomen light green. Eyes dark red. Antennae and wings whitish, as well as legs. Coxae dark. Wing pads, when present, very prominent. Distal half of cornicles darkened. Wings are rolled in a window curtain manner over dorsal side of body. After the skin is shed the wings, which have a silvery, crystalline appearance, gradually unfold and are spread out by the newly emerged adult to dry.

HOST PLANTS

In the field citrus has been found to be the most commonly infested, especially certain varieties of the mandarin family. The varieties of citrus were infested in the following order; those most heavily infested being placed first: King orange, Temple orange, Tangerine, pineapple orange, Valencia, and grapefruit.

The writer also carried on experiments on many plants as hosts, both in the laboratory and in the field. In the field it was found on loquat, wild plum and sand pear, and in the laboratory we were successful in breeding it on night-shade, Jerusalem Oak, milkweed, dogfennel, cudweed; also on lettuce and peppers. At the present time, however, the writer is conducting his experiments most succcessfully on Chinese spirea, on which the insect in question seems to have all the habits and characteristics of a species on its native host.

CHARACTER OF ATTACK

This aphid, unlike any species which has heretofore been found on citrus, attacks the young tender succulent growth, and the blossoms, calyx and young fruit, as well as the shoots and water sprouts. The method of its attack on the foliage is also characteristic in that it shows a tendency to attack the mid-rib of the leaf together with its branches. As a result a few individuals soon cut off the source of food supply of a leaf, causing it to

quickly curl at the point of attack. Repeated examination of cross sections of these leaves has shown many of the cells to be broken down and deficient in protoplasm, leaving a predominating quantity of cellulose.

The injury to the blossoms causes a large percentage of them to fall, while on the young fruit a double injury is inflicted. In the first place the rind of the fruit where it is punctured by the beak of the insect, develops little protuberances or knobs, loosing the smoothness of healthy, uninjured fruit. When punctured near the stem end much of the fruit was found to fall, often several weeks after the outbreak of the infestation. Besides the injury caused by the puncture and removal of the sap from the portion of the tree attacked, it is probable that a toxic effect is also produced by the insect.

NATURAL ENEMIES

It has been the experience of the writer in all his previous work on the Aphididae that in the case of outbreaks the aphids were usually attacked by hordes of natural enemies which soon controlled them, but in this instance the "laissez faire" policy does not seem to do, as this aphis is the least attacked by natural enemies of any species studied. This is due perhaps to several causes such as the recent introduction of the species, or the influence of meteorological conditions.

Of the beneficial insects three groups have been found to work on the aphid in the following order. First in importance about Lakeland is the Family *Coccinellidae,* or lady-beetles, of which the following species were found: The Blood Red, *Cyclomeda sanguinea,* the Twelve-Spotted, *Hippodamia convergens,* the Twice-Stabbed, *Chilcorus bivulnerus;* and the little *Scymnus binevatus.* Next in economic importance are the syrphus fly larvae, *Allogapta obliqua,* and *Lysephaebus testaceipes,* and third the Green Lace Wing Fly or Golden Eyed Lace-Wing of the Chrysopa genus.

Numerous collections of specimens were made for the purpose of determining whether any fungi were of economic value in the control of this pest, but no definite results were obtained. Among the enemies of lesser importance were recorded the tree cricket, and the lizard "camaleon."

Relation Between Ants and Aphids. An intimate relation was observed between ants and this species of aphid. Wherever ants were found to be numerous, the aphids were also found

to be well colonized. Three species of ants were noted by the writer, the most abundant being a species of *Camponotus*. The principal function of the ants was found by repeated observations and studies both in the laboratory and field, to be the removal of the honey dew from the foliage, thus keeping the leaves and twigs clean and conditions most favorable for the aphids. Where there were no ants it was found that many of the nymphs in moving about during feeding became entangled in the honey dew, which finally caused the weak individuals to perish. Much was done, therefore, toward the control of the aphids when all the ant colonies were destroyed.

CONTROL MEASURES

In the solution of the problem on which the writer was working it was obvious that measures for effective control must be tested out. The first experiments, conducted on April 10th when the outbreak was at its peak, consisted in testing spraying as an effective control measure. Where nicotine sulphate was used in a spray of 1 to 800 combined with either whale oil soap or Octagon laundry soap, one pound to each five gallons of water, it was found that very efficient results were obtained where it was possible to get the spray into actual contact with the insect. But this was not always possible because of the abundance of the curled foliage which served as a protection for many of the insects.

With the contact dusts, however, especially the three percent nicotine dusts, we estimated the kill to be about 95 percent where the experiments were conducted under the writer's personal attention. The spraying experiments showed an average killing of 85 percent.

These experiments were conducted on three-year-old Temple Orange trees in the Templetown Groves, Lake Wales, on April 9th, 1924, between 9:30 A. M. and noon. It was a bright sunny day, with a temperature of 80 degrees and a westerly wind blowing about 15 miles an hour.

Following is a table giving relative cost of spraying and dusting:

Spraying Machine: 300 gallon. Bean. Equipped with rods and two lines of hose, spraying four rows at a time.

		Cost
Mixture:	Lime Sulphur Solution (1 to 40) 7½ gal.	$1.20
	Black Leaf Forty (1 to 800) 3 pts.	5.07
	Kayso 2½ lbs.	.58
	Cost of materials	$6.85

Time:	Actual Spraying, ... 102 min.	
	Including loading, ... 120 min.	
	Labor, 3 men @ $.25 per hour	1.50
	Total cost of spraying	$8.35
Ground Covered:	548 trees or 4.3 trees per minute at cost of $.015 per tree.	
Dusting Machine:	Bean. Dust made in hopper of machine by adding 3 pints of Black Leaf Forty to 50 lbs. of hydrated lime and allowing agitator to run for five minutes.	
		Cost
Mixture:	Hydrated lime, 100 lbs.	$1.10
	Black Leaf Forty, 6 pts.	10.14
	Cost of materials	$11.24
Time:	1 hour 30 minutes—	
	Labor, 2 men @ $.25 per hour	.75
	Total cost of dusting	$11.99
Ground Covered:	332 trees or 3.4 trees per minute at cost of $.036 per tree.	

A stop was made at each tree of from 5 to 10 seconds. Therefore more dust was used and less ground covered than in the commercial practice of never stopping and only throwing a cloud of dust over the tree. In this instance the tree was dusted from three sides.

Similar experiments have been conducted in Lakeland, to which the writer added oil sprays, kerosene emulsion, soap solution, and the followning dusts: sulphur, calcium arsenate, combinations of lime and sulphur, and calcium cyanide.

The lowest percentage of kill was obtained from the sulphur dust, medium results were derived from oil, kerosene emulsion and soap emulsion, and the highest efficiency from the nicotine and the calcium cyanide dusts. However, the calcium cyanide was only effective when applied to the trees under tents, in which case a quarter of a pound was applied to four-year-old trees. The tree was left under the tent for a period of four minutes. This gave approximately a 100 percent kill. Some injury was done, however, to the tender foliage as a result of the burning caused by the dust. The nicotine dusts, which gave an average of 95 percent kill, were safer from the standpoint of the burning of the foliage, and had the added advantage of being less destructive to the parasites than was the calcium cyanide.

In our January issue, p. 41, we erroneously recorded Donald Reese as being present at the Cincinnati meetings. It should have been Chas. A. Reese. Mr. Reese, formerly of the State Plant Board, is now engaged in bee inspection work for the State of Ohio with headquarters at Columbus. Mr. Goodwin's initials were also erroneous. They should have been U. C.

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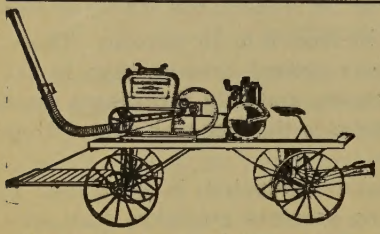
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